

A CYBER PHYSICAL SYSTEM FOR ENVIRONMENTAL MONITORING

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Abstract:

Cyber Physical Systems(CPS) are a new research paradigm in embedded systems. Cyber Physical systems are collaboration of physical and computational process. Different types of technologies such as sensing, communication, computation, control, cognition are used to create new technology. Cyber Physical Systems are intersection of different technologies such as real time systems, Distributed systems, control systems and wireless sensor networks. Cyber physical systems have diversified applications include smart grid, autonomous automotive systems, medical monitoring, process control systems, distributed robotics, and automatic pilot avionics. This paper presents a survey on different types of applications of cyber physical systems

Keywords: Cyber Physical Systems, Embedded systems, Control systems, smart grid, Traffic System Control, Humanoid robots.

1. INTRODUCTION

Cyber-Physical Systems (CPS) is integrations of computation, networking, and physical processes. Embedded computers and networks monitor and control the physical processes, with feedback loops where physical processes affect computations and vice versa [2].

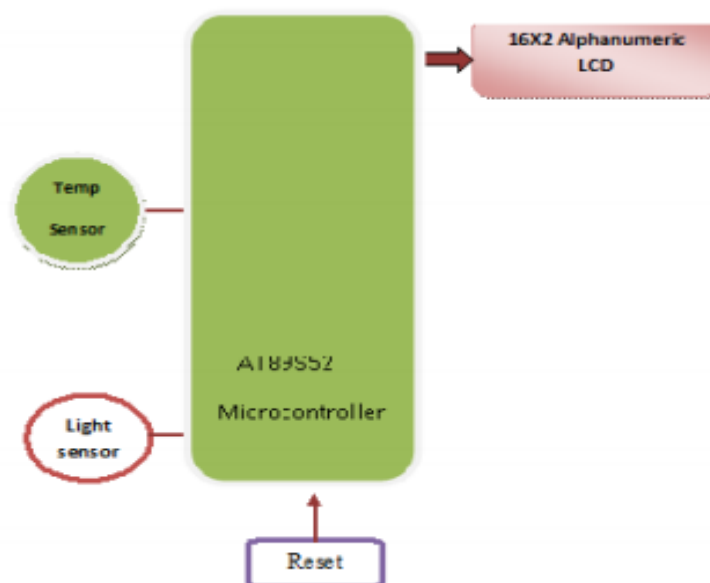


Fig.1.General Structure

The technology builds on the older (but still very young) discipline of embedded systems, computers and software embedded in devices whose principle mission is not computation, such as cars, toys, medical devices, and scientific instruments [2]. Due to cyber physical systems huge systems existing in the physical world can exchange data, interact with each other, access web services in the future. By merging computing and communication with physical processes and mediating the way we interact with the physical world, Cyber-Physical Systems has many advantages (i) they make systems more efficient and safer. They reduce the cost of building and operating these systems; and they allow individual machines to work together to form complex systems that provide new capabilities. Greenhouse effect is one of the major problems in today's world. The old buildings consume 70% of the electricity produced and generate the green house gases which in turn increase green house effect. By using the integrated Wireless Sensor Network, cognition manager and control systems we can achieve Zero Net Energy goal. Smart grid is an ecosystem which will rely on its basis on information acquisition assessment and decision making as well as management. In smart grid many traditional parts use Cyber Physical Systems. They are used in generation, transmission and distribution and also in customer side. In generation it will control the connection the network as well as the operational aspects in the electricity generation. CPS monitor the conditions and care for the stability of transmission and distribution networks that connect end-users to smart grid.

2. RELATED WORK

A cyber physical system is being developed to monitor the environmental conditions or the ambient conditions in indoor spaces at remote locations. The communication between the system's components is performed using the existent wireless infrastructure. Some indoor places like poultry need continuous monitoring of few environmental parameters which cannot be identified by human. So there is a need for electronic equipment.



Fig.2.Example of monitoring

We are using few sensors to detect and intimates to the controller which acts as heart of entire system. This project uses sensors such as Humidity, Smoke Sensor, Temperature sensor (LM35). Whenever hazardous gas is detected then buzzer alert is given. The temperature sensor LM35 senses the temperature and converts it into an electrical (analog) signal. The analog signal is converted into digital format by the analog-to-digital converter (ADC). Then the fan will be ON. The status of every sensor will give updates through the IOT.. Light gets on when ever LDR senses night mode. Motor will be on in case of dry condition detected by moisture sensor. ESP8266EX offers a complete and self-contained

WiFi networking solution; it can be used to host the application or to offload WiFi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. It has integrated cache to improve the performance of the system in such applications. Alternately, serving as a WiFi adapter, wireless internet access can be added to any micro controller-based design with simple connectivity (SPI/SDIO or I2C/UART interface).

3. PROPOSED SYSTEM

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code. Flash Magic is a tool which is used to program hex code in EEPROM of micro-controller. It is a freeware tool. It only supports the micro-controller of Philips and NXP. It can burn a hex code into that controller which supports ISP (in system programming) feature. Flash magic supports several chips like ARM Cortex M0, M3, M4, ARM7 and 8051. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. A PIR sensor, or Passive Infrared sensor, is a type of detector that is capable of detecting infrared light emitting from objects within its field of view. PIR sensors differ from other infrared sensors because they are only able to receive infrared waves rather than being able to emit and receive them. Because all objects emit infrared (electromagnetic waves that travel with heat), PIR sensors are able to detect objects that are in front of them. In fact, PIR sensors can see many things that humans cannot. PIR sensors are used for a number of applications, such as night vision, motion detection, and laser range finding. Cyber Physical Systems can be used in Smart learning environment. CPSs can be used in the SLE to gather adequate information about the physical environments, convert measured data to information and knowledge, and eventually provide useful and prompt services for students, staffs and the university. Smart learning environment (SLE) will definitely transform the way people learn and work in universities

4. ANALYSIS

This paper discussed the applications of Cyber physical systems in different domains briefly. CPS provides better solutions to some of the real time problems facing in today's world. Cyber Physical Systems change the way how humans interact with the physical world. In future we discuss the application of Cyber Physical System in each domain elaborately. Cyber Physical Systems provide a way to improve traffic system control performance. Road Traffic-control Cyber Physical System constructs an environment that exists in the natural geographical environment and manmade environment such as bridges across the sea or rivers, long and big tunnels, high-risk sub-grade slope, urban elevated bridges, etc but, but also massive variety of vehicles, people and goods in the complex road environment. Intelligent Transportation System, can realize the traffic control by adding and installing a large amount of advanced electronic devices and information systems to the road traffic system, improving operational efficiency and safety level for the road traffic system Traffic control Cyber Physical Systems integrate these information into the transportation process, and operate through their coordination making the transportation more safe and efficient Today lot of civil engineers faces the problem stewardship of ageing of infrastructure like dams, bridges, buildings etc. Fiber optic sensors and Micro electrical and mechanical sensors and wireless communication technologies offer tremendous promise for accurate and continuous infrastructural monitoring [Cyber-Physical Systems

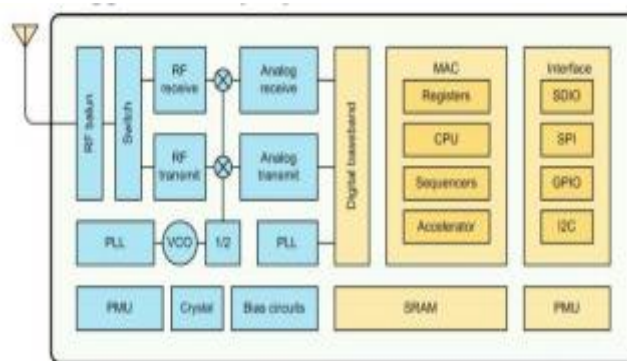


Fig.3.Software

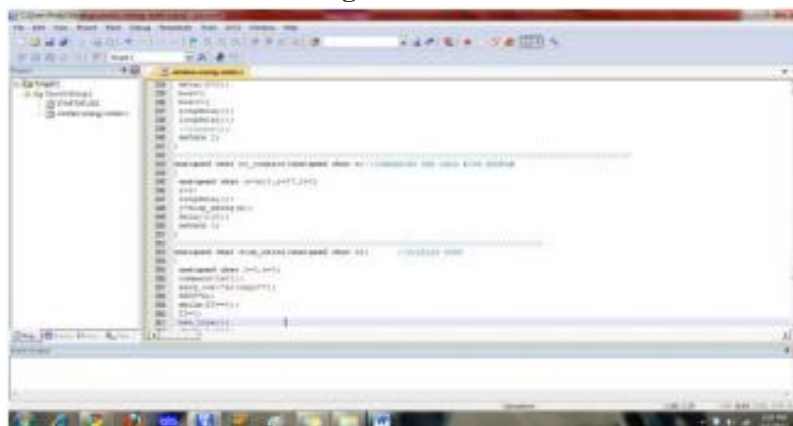


Fig.4.Output

are used for Aeronautic applications such as flight test instrumentation, Pilot-crew communications, Structure Health Monitoring, In-flight tests, in flight entertainment Wireless Cabin, and flight landing etc. LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1,000,000 ohms, but when they are illuminated with light, the resistance drops dramatically.

CONCLUSION

The greenhouse vegetable production needs less labor, less capital, has faster returns than normal vegetable production. We have arranged few sensors to maintain environment automatically. The status of every sensor will given through the SMS. Here PIR, LDR sensors are also used and their respective relay are also activated accordingly.

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